

## PATENT SPECIFICATION

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DRAWINGS ATTACHED

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## (54) ARTICLE HANDLING MACHINE

- (71) We, U.G. TABLEWARE LIMITED, formerly Ravenhead Glass Limited, a Company organised under the laws of Great Britain, of P.O. Box 48, St. Helens, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 This invention relates to an article handling machine. The invention is especially concerned with a machine which will pick up an article, invert it, and set it down at a point remote from the pick-up point. The invention is especially applicable in the glass industry, where it is required in certain glass-forming operations to remove a partially formed glass article from one machine and to place it in another wherein the forming of the article is completed.
- 20 For instance, glass tumblers are often formed in the shape of jars or bottles, and the excess glass or moil is subsequently removed to leave the articles in the desired shape. Stemware is formed in a similar way, the excess glass being burnt off to leave the required shape. In the case of tumblers, these are often inverted before the moil is burnt off. In the case of stemware, the bowl of the article is formed first, the moil is removed, and thereafter the stem is applied. If, as is usually the case, the bowl is formed upright and the stem is pressed on thereafter, the bowl is normally inverted before the stem is applied, since this is most conveniently done by dropping a gob of molten glass onto the inverted bowl and pressing it into shape in a mould. Thus, between the forming machine for the bowl and the machine for applying the stem the bowl is inverted.
- 45 Until recently this was an operation which was carried out by hand, but recently there has come into use a machine which removes the partially formed bowl from a conveyor leading from the forming machine, inverts it, and sets it down in a second machine which burns off the moil. The bowl is then transferred to a third machine which applies the stem. This handling machine comprises a rotatable turret carrying a number of pairs of gripping jaws which open and close to release and secure the articles being handled. The inversion of the articles is accomplished by means of rack and pinion mechanisms. Each pair or set of gripping jaws is provided with a pinion which, at certain times in the rotary movement of the turret, is engaged by a rack which moves vertically up and down. By the upward movement of the rack the gripping jaws are rotated through 180° in order to invert the article being carried. After the article has been set down at the required position the rack is moved vertically downwardly in order to return the gripping jaws to their initial article-receiving position.
- There are a number of disadvantages in the use of such a machine. In the first place the rack and pinion mechanism makes the machine very cumbersome, since it will be appreciated that there must be a rack for every pinion and consequently a rack for every pair of gripping jaws. Further, it is necessary to effect two turning movements of the jaws to bring them back into their initial gripping position, and the jaws, by virtue of their having a sliding movement along a pair of parallel posts in order to accommodate ware of different heights, do not exert a positive gripping action on the articles which they are handling.
- We have now developed an article handling machine which overcomes all of the disadvantages outlined above.
- According to the present invention an article handling machine comprises a vertically disposed shaft adapted for continuous rotation about its vertical axis; a gripper assembly on said shaft and rotatable therewith, said gripper assembly comprising a plurality of gripper heads regularly disposed around said shaft, each of said gripper heads comprising a pinion, a pair of rotatably

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mounted gripping jaws and means for moving said jaws towards and away from each other which means comprises a roller associated with each gripper head following a stationary cam provided on a stationary plate that is situated above said gripper assembly and carries a rack at a position between that at which articles are received and that at which articles are released said rack and pinions being so disposed that the rack engages in turn the pinion of each of said gripper heads and hence rotates said jaws through 180°C.

The gripping jaws are preferably spring-loaded in the closed position. They are opened by a mechanism involving a roller cam follower preferably carried on the end of a shaft forming part of the gripper head, the cam follower following a stationary cam fixed to the stationary plate carrying the turnover rack.

In the case of tall glassware there is a possibility that an article of ware, as it is inverted, will strike either the article in the preceding pair of gripping jaws or the article in the succeeding pair of jaws or both, and to avoid this the gripper heads may be adapted to be retracted towards the rotating shaft whilst the jaws are being inverted, returning to normal position thereafter. This may be accomplished by providing the underneath of the stationary plate with a cam in the form of a groove, and by providing each of the gripper heads with a cam follower which rides in the groove. Alternatively, one or both of the heads adjacent that inverting the ware may be retracted.

It is always preferred that articles should be gripped and inverted about their centre lines, and clearly therefore if the machine according to the invention is to be used at different times for short and tall articles some adjustment of the machine will be necessary. We provide such adjustment by making the whole of the gripper assembly movable up and down the vertical shaft. This is preferably achieved by providing the gripper assembly with a lifting nut and screw-threading the shaft.

An embodiment of the invention will now be described with reference to the drawings accompanying the Provisional Specification, in which

Figure 1 is a sectional elevation of the important parts of the machine;

Figure 2 is a plan view of a gripper head; and

Figure 3 is a diagrammatic plan view of the stationary plate showing the cam for retracting the gripper heads at certain positions.

With reference to Figure 1, there is shown a vertical shaft 1 adapted for continuous rotation by means of gearing shown generally at 2. Attached to shaft 1 and rotatable

with it is a gripper assembly designated generally 3 comprising a number of regularly disposed gripper heads 4.

Each gripper head 4 has a pair of gripping jaws 5. These are arranged to be opened and closed by means of a rack and pinion mechanism 7 which is actuated by means of a roller cam follower 8, attached to the end of shaft 9, engaging a cam 10 fixed to the underneath of stationary plate 11. The jaws 5 are spring-loaded in the closed position by means of spring 12.

The gripper head is also provided with a further cam follower 13 which runs in cam groove 14 provided in plate 11. The shape of cam groove 14 determines the positions at which the heads 4 are retracted so as to avoid interference between adjacent articles being handled.

Each gripper head 4 is also provided with a pinion 15 which at some time during the movement round the shaft 1 of the gripper assembly engages with a short rack 16 fitted into plate 11. Rack 16 is such that the gripping jaws are turned through an angle of 180°.

In a particular operation wherein the machine according to the invention is especially applicable, glass ware is delivered from a forming machine onto a conveyor. On reaching the end of the conveyor it is arrested by a starwheel and transferred, over a dead plate, into the path of gripping jaws 5 which are in the open position. As the gripping assembly 3 rotates, in time with the ware, the action of roller 8 on cam 10 causes the jaws to close and grip the ware, removing it from the dead plate.

Further rotation of gripping assembly 3 causes pinion 15 to engage rack 16, whereupon the gripping jaws and the gripped ware are inverted. When the ware comes over the take-off position, e.g. in the machine for burning off the moil, cam 10 causes the gripping jaws to open and release the ware.

Figure 3 shows how cam groove 14 may be shaped, as at 17 so as to retract the gripper head 4 adjacent that being inverted in order to avoid interference. It may also be necessary, when depositing inverted ware into a machine which is also rotating about a vertical axis, for the path of the gripping jaws 5 to follow the path of the receiving stations in the machine into which the ware is being deposited. This may be accomplished by suitable shaping of cam groove 14, as at 18.

It will be appreciated that a second rack may be provided on plate 11 if it is considered necessary that the jaws should be re-inverted before they next pick up an article. However, in most cases there is no necessity for such a second rack to be provided.

As mentioned above, it is desirable that ware being transferred from one station to another should be gripped and inverted about the centre line of the ware. Clearly, to accommodate ware of different heights the gripping jaws must be adjustable vertically. We prefer that this be done by adjusting the height of the complete gripper assembly, and Figure 1 shows how this may be done. The vertical shaft 1 is screw-threaded and is engaged by the nut 19 which fixes the position of the gripper assembly. Suitable adjustment of nut 19 will allow the gripper assembly to be raised or lowered depending on the height of the articles being handled.

The efficiency of the machine according to the invention was not to be expected in view of the fact that, since the rotation of the shaft and gripper assembly is continuous rather than intermittent, the pinions of the gripper heads strike the rack in the plate with considerable force. Nevertheless individual racks last a considerable time, and even when one does wear out it is a simple job to unscrew two or three nuts holding the rack in place and insert a replacement.

#### WHAT WE CLAIM IS:—

1. An article handling machine comprising a vertically disposed shaft adapted for continuous rotation about its vertical axis; a gripper assembly on said shaft and rotatable therewith, said gripper assembly comprising a plurality of gripper heads regularly disposed around said shaft, each of said gripper heads comprising a pinion, a pair of rotatably mounted gripping jaws and means for moving said jaws towards and away from each other which means com-

prises a roller associated with each gripper head following a stationary cam, provided on a stationary plate that is situated above or below said gripper assembly and carries a rack, said rack and pinions being so disposed that the rack engages in turn the pinion of each of said gripper heads and hence rotates said jaws through 180°.

2. A machine as claimed in claim 1 wherein the gripping jaws are spring-loaded in the closed position.

3. A machine as claimed in claim 1 or claim 2, wherein means are provided for retracting each gripper head towards said shaft at a point during the movement of said gripper head.

4. A machine as claimed in claim 3, wherein the stationary plate is provided with a cam groove in which rides a cam follower mounted on each gripper head.

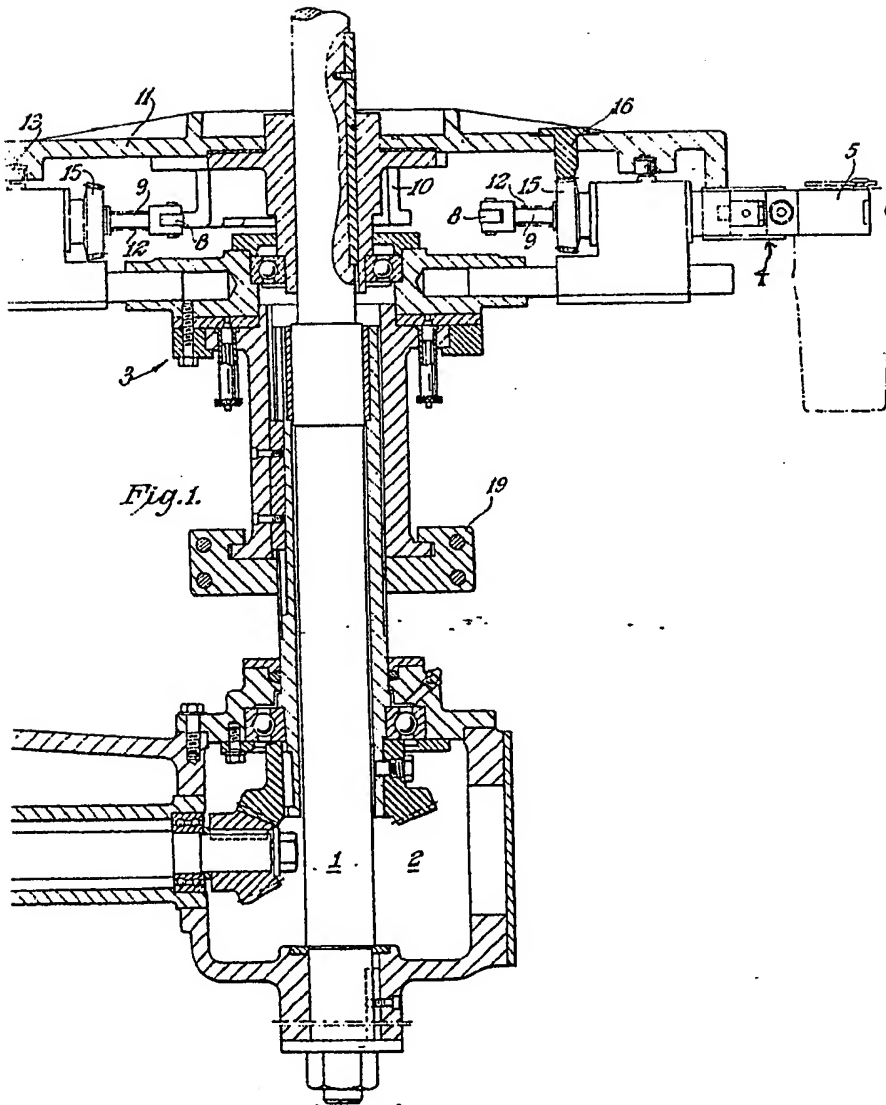
5. A machine as claimed in any of claims 1 to 4 wherein the gripper assembly is adjustably movable on the vertical shaft.

6. A machine as claimed in any of claims 1 to 5 comprising a second rack carried on said stationary plate for engagement with said pinions to re-invert the gripping jaws.

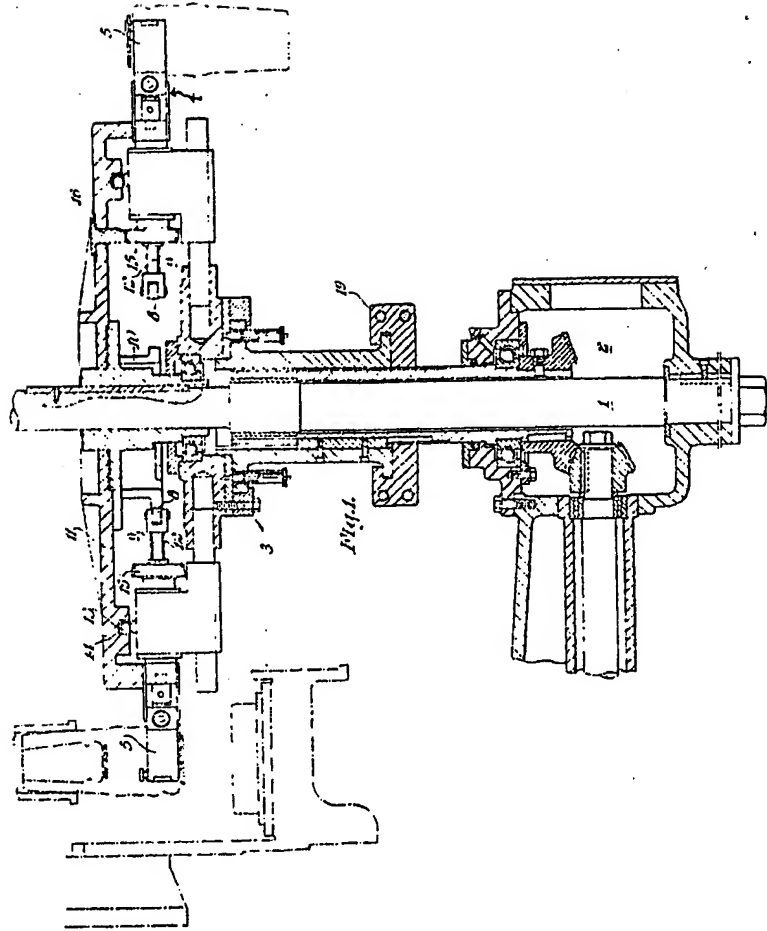
7. An article handling machine, substantially as hereinbefore described with reference to the drawings accompanying the Provisional Specification.

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 Sheet 1

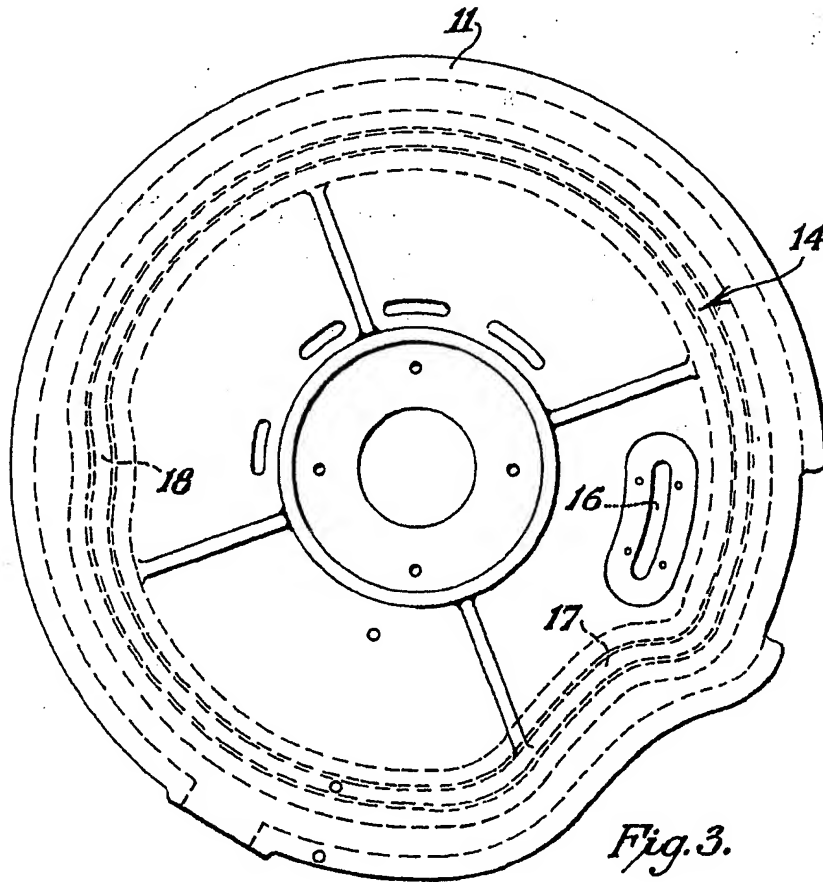
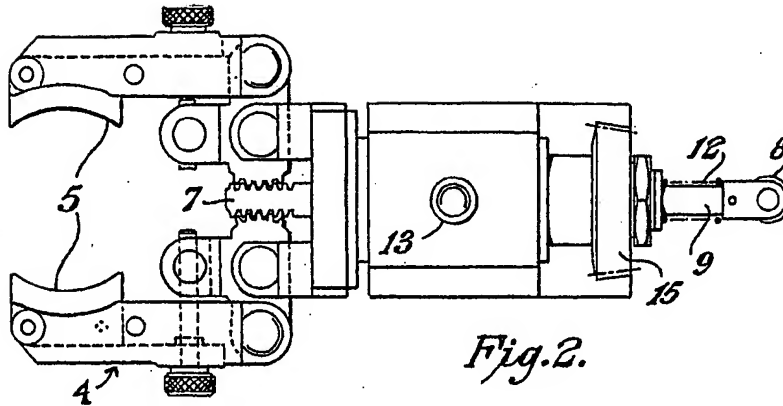


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